

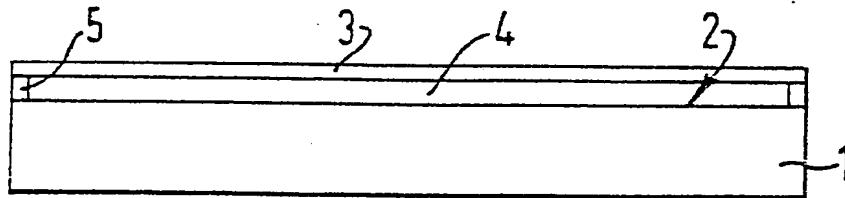
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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>3</sup> :		A1	(11) International Publication Number: WO 81/00787	
H01H 13/70			(43) International Publication Date: 19 March 1981 (19.03.81)	
(21) International Application Number: PCT/GB80/00141			(74) Agents: BURFORD, Anthony, Frederick et al.; W.H. Beck, Greener & Co., 7 Stone Buildings, Lincoln's Inn, London WC2A 3SZ (GB).	
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(71) Applicant (for all designated States except US): ERIC MARSHALL DESIGN INTERNATIONAL LTD. [GB/GB]; 36 Stafford Road, Wallington, Surrey, SM6 9AA (GB).			Published <i>With international search report</i>	
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(75) Inventor/Applicant (for US only): MARSHALL, Eric, John [GB/GB]; 5 Carlton Gardens, London S.W.1 (GB).				

(54) Title: SWITCH STRUCTURE WITH TOUCH ELEMENT



(57) Abstract

A switch structure includes switch means operable by the finger-tips of an operator, e. g. in an electrical typewriter or computer terminal. To impart a desired "touch" characteristic, the switch structure has a touch element overlying the contact surface, or switch actuation element, of the switch means, the touch element providing a degree of resilient resistance to touch and pressure by the finger tips. The resistance may be that of resilient solid or cellular material, displaceable liquid, or gas, or any combination thereof.

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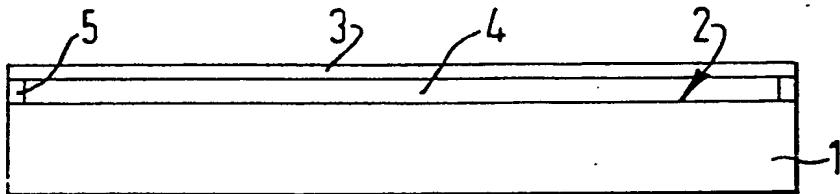
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"SWITCH STRUCTURE WITH TOUCH ELEMENT"

This invention relates to a touch element incorporated in a switch structure for operation by light touch of the finger-tips of an operator, for example for the operation of an electrical typewriter,  
05 a computer terminal or other electronic machine into which information must be fed.

With switch means of that kind in which there is no movable element to be moved by the finger-tip in the course of an actuation of the switch, e.g. known  
10 proximity switches, there is no relative movement of the finger-tip surface after making contact with the exposed surface of the switch means, and accordingly there is no "touch" experienced by the operator who must assume that the mere contacting of the switch  
15 means has in fact actuated the switch means. Expressed in another way, there is no velocity feedback, through the finger-tip, to the operator and this may be experienced as a lack of achievement which is the opposite of the satisfying displacement of a typewriter  
20 key or snap-switch.

Similarly, with switch means which do possess an element which must be shifted by the finger-tip to give rise to an actuation of the switch means, the manner of and extent of shifting of the switch element



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may be far from that which is desirable, in the sense of "touch" for the operator.

In the context of this specification, the term "non-shiftable" switch means indicates hereinafter a 05 switch means which has no element requiring to be moved by the finger-tip to cause actuation of the switch, and the term "shiftable" switch means indicates hereinafter a switch means having an element which requires to be moved by the finger-tip to cause actuation of the 10 switch.

It is the object of the present invention to provide a switch structure incorporating a touch element whereby there may be imparted a desired "touch" characteristic for a non-shiftable switch means, or a 15 modified "touch" characteristic for a shiftable switch means.

According to the present invention an electrical switch structure, for actuation with the finger-tips, comprises switch means having a surface 20 towards which the finger-tip is moved to cause actuation, and a touch element overlying that surface and presenting an exposed face for contacting with the finger-tip, the touch element having between that face and that surface a zone which provides resilient 25 resistance to movement of that face towards that surface.



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In its simplest form, the touch element may comprise a simple layer of a resiliently deformable nature overlying the surface of the switch means, the remote face of the layer being exposed for contacting with the finger-tips. By way of example, the resistance zone includes or consists of resilient solid or resilient cellular material.

In another form, the touch element comprises a finger-contact sheet which is discrete from the 10 resistance zone and on which the exposed face of the touch element is provided. With such a construction, the resistance zone may include or consist of gas, liquid, resilient solid or resilient cellular material, or any combination thereof.

15 In order that the invention may be readily ascertained, some embodiments of switch structure with a touch element, in accordance with the invention, are hereinafter particularly described with reference to the accompanying drawings, wherein:-

20 Figure 1 is a schematic vertical section of a  
first embodiment, suitable for a non-shiftable switch  
means (as hereinbefore defined);

Figure 2 is a schematic vertical section of a second embodiment, suitable for a non-shiftable switch means;

Figure 3 is a schematic vertical section of a



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third embodiment, suitable for a non-shiftable switch means;

Figure 4 is a schematic vertical section of a fourth embodiment, suitable for a shiftable switch means (as hereinbefore defined);

Figure 5 is a schematic vertical section of a fifth embodiment, suitable for a shiftable switch means; and

Figure 6 is a schematic vertical section of a sixth embodiment, suitable for a shiftable switch means.

Referring to Figure 1, there is shown a switch structure having a touch element and switch means of non-shiftable type. The switch means 1 is for example a known proximity switch. It suffices to state that the switch is actuated by the placing of a finger tip onto, or very near to, the upper surface 2. Such a switch may be operated by simply placing the finger-tips onto the exposed upper surface 2, but there is a correspondingly "dead" touch for the operator. In accordance with this invention there is provided a touch element which comprises a finger-contact sheet 3 which is normally spaced from the upper surface 2. The sheet 3 is flexible, or resiliently bendable. Between the sheet 3 and the upper surface 2 there is a zone 4 of a resilient loading medium, which may be

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air or other gas at atmospheric pressure, or air or other gas at greater than atmospheric pressure, or a liquid displaceable against resilient loading, or with controlled displacement, or a resiliently deformable 05 material such as an elastomeric or plastics material in solid or cellular state. Any combination of such gas, liquid and material may be provided in the zone 4 between the sheet 3 and the surface 2.

Where gas or liquid is included, the zone 4 10 may be compartmented, provided with different exhaust or displacement paths, or otherwise modified from location to location of switching positions so as to provide different "touch" characteristics at different locations of the sheet 3. This may be useful, for 15 example, to lessen the relative pressure to be applied by a typist's third and fourth fingers. Similarly, the physical characteristics of any material included in the zone 4 may be modified from location to location.

Although the switch structure has been illus- 20 trated as including boundary spacer means 5 between the sheet 3 and the surface 2, these may be omitted and the sheet 3 caused to contact the surface 2, say at edge portions. The sheet 3 and/or the surface 2 may be provided with projections extending towards the 25 other to act as spacer means, and/or to limit approaching movement of the sheet 3 towards the surface 2.



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Figure 2 is a similar view of a structure in which the discrete sheet 3 is eliminated and is replaced in function by the exposed upper face portion 6 of a layer 7 of resiliently compressible material, e.g. a 05 layer of a cellular material.

Figure 3 is a similar view of a structure in which the components of the touch element are the same as in Figure 1, but with the addition of a lower bounding sheet 8 for the zone 4. This provision 10 enables the assembly of sheet 3 and sheet 8, with an intermediate zone 4 of gas, liquid, solid or cellular material, to be manufactured as a separate entity which can be applied to a switch 1.

Referring now to Figure 4 there is shown a 15 combination of touch element with switch means of the shiftable type. It suffices to state that the switch 9 is actuated by movement, with the finger-tip, of an element 10 of the switch in the direction of the arrow "A", with respect to the remainder of the switch 9. 20 The element 10 is physically connected to the remainder of the switch, and is situated beneath a finger-contact sheet 11 which is spaced above the switch 9 by a zone 12 having any of the characteristics described above for the zone 4 of Figures 1-3. In a modification, 25 the discrete finger-contact sheet 11 may be eliminated in the manner described for Figure 2. In another

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modification, there may be added a lower bounding sheet in the manner described in relation to Figure 3.

Figure 5 shows a construction which is similar to that of Figure 4, and to which the same characteristics and modifications may be applied, but wherein 05 the shiftable switch element 10a is normally flush with, or below, the upper surface of the switch 9.

Figure 6 shows a construction which is similar to that of Figure 4, and to which the same characteristics and modifications may be applied, but wherein 10 the shiftable switch element 10b is carried at the underside of the finger-contact sheet 11 or its equivalent.

The sheet 3 or 11, or the exposed upper face of 15 the material of zone 4 or 12, may be in plate or strip form, and marked with switch indications or left unmarked, and may be physically modified at areas to indicate where finger-tip contact is desired, e.g. provided with raised or depressed areas to assist in 20 seeing, and finding with the finger-tip, the required switch location.

With the improvement of the present invention, the desired "touch", involving extent of movement for switch operation and the desired resistance to finger- 25 tip movement, may be imparted to the switch means irrespective of the natural "touch", or lack of it, in the switch means as manufactured.

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CLAIMS

1. An electrical switch structure, for actuation with the finger-tips, comprising switch means having a surface towards which the finger-tip is moved to cause actuation, and a touch element overlying that surface and presenting an exposed face for contacting with the finger-tip, the touch element having between that face and that surface a zone which provides resilient resistance to movement of that face towards that surface.
- 10 2. An electrical switch structure, as claimed in Claim 1, wherein the exposed face of the touch element is on a finger-contact sheet which is discrete from the resistance zone.
- 15 3. An electrical switch structure, as claimed in either of Claims 1 and 2, further comprising a bounding layer disposed between the resistance zone and the surface of the switch means.
- 20 4. An electrical switch structure, as claimed in either of Claims 2 and 3, wherein the resistance zone includes or consists of gas, liquid, resilient solid or resilient cellular material, or any combination thereof.
5. An electrical switch structure, as claimed in Claim 1, wherein the resistance zone includes or

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consists of resilient solid or resilient cellular material.

6. An electrical switch structure, as claimed in any one of Claims 1 to 5, wherein the switch means is  
05 non-shiftable, as herein defined.

7. An electrical switch structure, as claimed in any one of Claims 1 to 5, wherein the switch means is shiftable, as herein defined.

8. An electrical switch structure substantially as  
10 described herein with reference to any one of Figures 1 to 3 of the accompanying drawings.

9. An electrical switch structure substantially as described herein with reference to any one of Figures 4. to 6 of the accompanying drawings.



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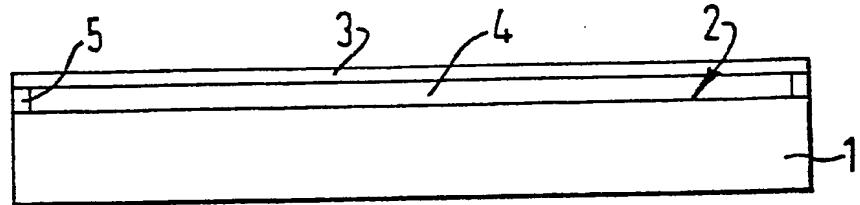


FIG. 1.

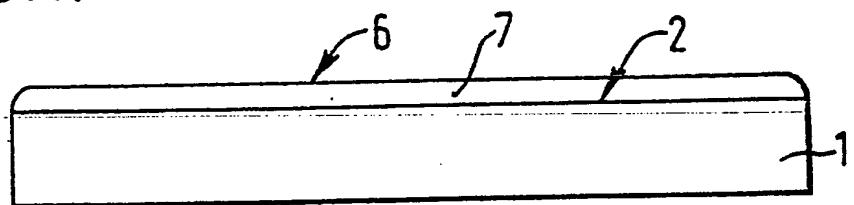


FIG. 2.

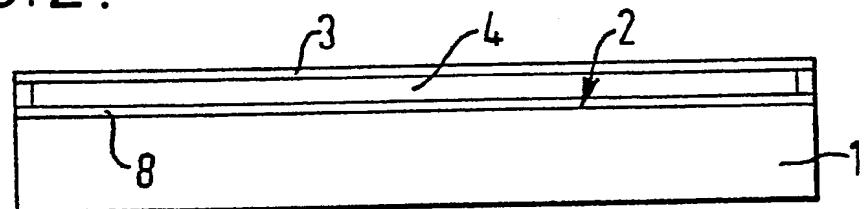


FIG. 3.



FIG. 4.

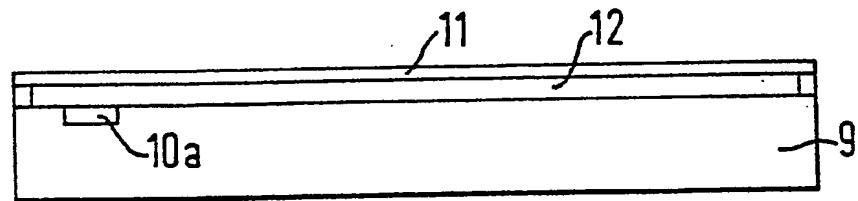


FIG. 5.

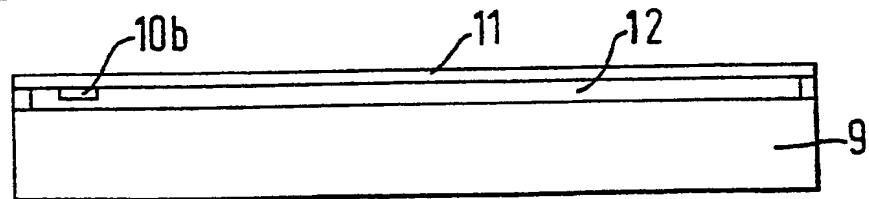


FIG. 6.

# INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 80/00141

**I. CLASSIFICATION OF SUBJECT MATTER** (if several classification symbols apply, indicate all) <sup>3</sup>  
According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl.<sup>3</sup> H 01 H 13/70

## II. FIELDS SEARCHED

Classification System	Classification Symbols	Minimum Documentation Searched <sup>4</sup>
		Classification Symbols
Int.Cl. <sup>3</sup>		H 01 H 13/70; H 01 H 13/52
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>5</sup>		

## III. DOCUMENTS CONSIDERED TO BE RELEVANT <sup>14</sup>

Category <sup>6</sup>	Citation of Document, <sup>16</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>
X	US, A, 4046975, published September 6, 1977 see column 1, lines 58-70; column 4, lines 1-8, Chomerics Inc. -- GB, A, 2000375, published January 4, 1979 see page 2, lines 20-100, The Cornelius Cy. -- IBM Technical Disclosure Bulletin, vol. 19, no. 6, issued 1967 November (Armonk, New York, US), A. Caswell et al.: "Bounceless multiple contact switch" see pages 699 and 700 -- GB, A, 1178607, published April 26, 1966 see page 2, lines 52-74, IBM -- US, A, 4024368, published May 17, 1977 see columns 3 and 4, column 5, lines 1-19, Litton Systems Inc. -- US, A, 4017848, published April 12, 1977 see column 3, Rockwell Int. Corp. --	1-4, 7-9 1-4, 7, 9 1-4 1-5 1-4 1-4 1-4 . / .

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"T" later document published on or after the international filing  
date or priority date and not in conflict with the application,  
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the invention

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## IV. CERTIFICATION

Date of the Actual Completion of the International Search <sup>19</sup>

5th November 1980

Date of Mailing of this International Search Report <sup>20</sup>

12th November 1980

International Searching Authority <sup>21</sup>

European Patent Office

Signature of Authorized Officer <sup>22</sup>

G.L.M. Kruydenberg

## III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, <sup>16</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No <sup>15</sup>
A	IBM Technical Disclosure Bulletin, vol. 18, no. 10, issued March 1976 (Armonk, New York, US), R.J. Welfrom: "Adjustable key force control", see pages 3388 and 3389	1
A	US, A, 3503031, published March 24, 1970 see column 2, lignes 28-71; column 3 Control Data Corp. -----	6